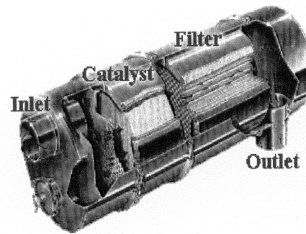




## Challenges and Feasibility for the use of Diesel Particulate Traps in Mobile Agriculture Applications



Professor H.A. Dwyer  
Professor M. Kleeman  
Dr. C.J. Brodrick

ARB, May 30, 2001



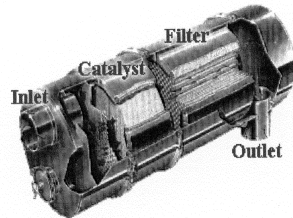
## Program Objectives

- Assess the applicability of particulate traps to ag vehicles, given their diverse operating patterns, exhaust temperature ranges, and age distribution
- Determine failure modes, safety procedures, maintenance schedule, and expected lifespan for trap
- Estimate emissions curtailment possible through trap retrofitting
- Quantify the effect of the traps on PM, toxic species, and particle size distribution

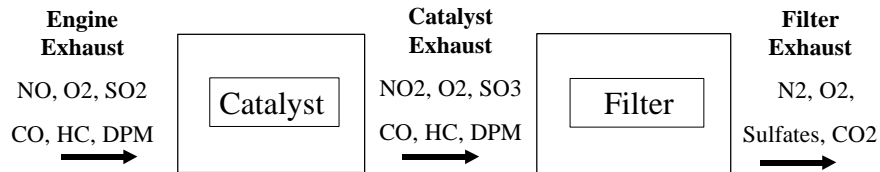
ARB, May 30, 2001



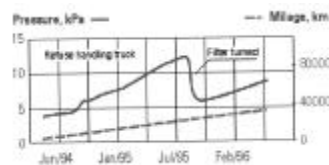
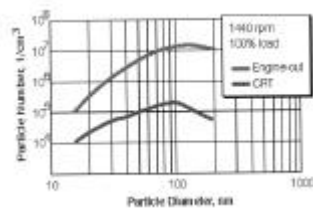
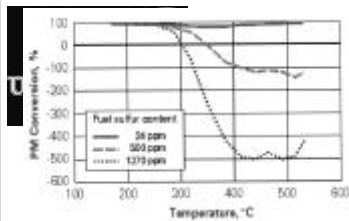
## Passive CRT Principle and Geometry



### CRT Trip Schematic (Continuously Regenerating Trap)



ARB, May 30, 2001



## Performance of CRT Systems

- Very Good Performance with low Sulfur Fuels
- Very Bad Performance with high Sulfur Fuels
- Very Good Reduction in DPM at all Particle Diameters
- Excellent Backpressure Behavior with low Sulfur Fuels and Low Oil Burning Engines

ARB, May 30, 2001

Professor H. A. Dwyer - UC



**Project Participants:**

- University of California, Davis
- Vehicle/Engine Manufacturer
- Farmers and Conglomerates

**Project Support:**

- ARB
- Air Quality Management Districts

*ARB, May 30, 2001*



**Current Projects**

- SCR Demonstration
- CNG-Hybrid Truck Design
- SF MUNI Hybrid Evaluation
- Fuel Cell Truck APU

**Personnel Expertise**

- Harry Dwyer – Daimler Engine Consultant
- Mike Kleeman – Particulate Measurements
- C.J. Brodrick- Emissions Inventory  
& Characterization

*ARB, May 30, 2001*



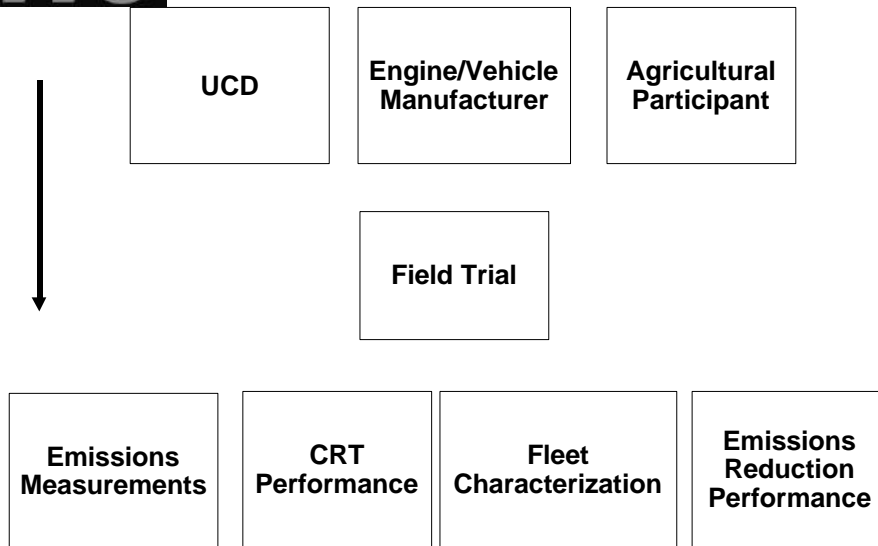
## Scope and Plan

- Determine which Ag equipment to test (i.e. identify representative size engines, model years, type of equipment)
- Identify in-use driving patterns
- Instrument vehicles to record realistic tractor driving patterns
- Measure emissions with and without traps

ARB, May 30, 2001



## Project Structure





## **Future Possible Applications**

- **Active traps for older vehicles**
- **Combined NOx-particulate traps**
- **Non-agricultural off-road**

*ARB, May 30, 2001*



## **Summary**

- **Potential for Large Emissions Reductions**
- **Current On-Road Performance Viability**
- **Public and Private Sector Enthusiastic Support**
- **Highly Skilled UCD Team with Experienced Partners**
- **High Potential for Success**

*ARB, May 30, 2001*



## European High Mileage Experiences – Sweden

### Typical Sulfur Content 2-4 PPM S; Maximum 10 PPM S

- Total Number of Systems – 6000
- Seven Systems were engine bench tested after use

CRT <sup>TM</sup> No.	Vehicle Application	Emission Certification Level	Accumulated Distance, km, (mi)	Accumulated In- use time, months	Engine Displacement, litres, and Power, kW	
#1	intercity train	Euro 2	600,000 (372,902)	36	14	310
#2	airport bus	Euro 0	575,267 (357,531)	57	10	210
#3	express bus	Euro 2	490, 098 (304, 598)	35	10	265
#4	mail truck	Euro 0	473,800 (294,469)	63	7	170
#5	city bus	Euro 0	228,808 (142,205)	46	11	187
#6	garbage truck	Euro 0	206,503 (128,342)	57	7	169
#7	garbage truck	Euro 0	105,780 (65,743)	37	7	169